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ABSTRACT

Intended for students interested in the aircraft and missile field of engineering and drafting, the course covers fundamentals, working drawings, and auxiliary views and sections that are related to this field. Considered advanced training, a prerequisite for the course is mastery of the skills indicated in Electrical and Electronic Drafting--9257.01. The student will become proficient in preliminary drawings, functional drawings, proposals, model drawings, layouts, working drawings, detail drawings, and assembly and installation drawings. The course offers instruction in dimensioning, airframe, mechanical control, hydraulic systems, and electronic systems. Totaling 135 clock hours, the course consists of five instructional blocks: (1) introduction to aeronautical drafting, (2) fundamentals, (3) working drawings, (4) auxiliary views and sections, and (5) Quinmester posttest. The student is introduced to various types of tools and equipment and is provided with an opportunity for instruction and laboratory experiences. The bibliography lists basic references, workbooks, and supplementary references, and a sample Quinmester posttest concludes the document. (Author/MW)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

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Course Outline
DRAFTING 3 - 9257
(Aeronautical Drafting)
Department 45 & 48 - Quin 9257.02

CE001995

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1973

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D A D E C O U N T Y P U B L I C S C H O O L S

1450 NORTHEAST SECOND AVENUE

MIAMI, FLORIDA 33132

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Course Outline

DRAFTING 3 - 9257
(Aeronautical Drafting)

Department 45 & 48 - Quin 9257.02

county office of

VOCATIONAL AND ADULT EDUCATION

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Course Description

9257	45 & 48	9257.02	Aeronautical Drafting
State Category Number	County Dept. Number	County Course Number	Course Title

This course will instruct the student in the method and standard used in the aircraft and missile fields. The student will become proficient in preliminary drawings, functional drawings, proposals, model drawings, layouts, working drawings, detail drawings and assembly and installation drawings. The course offers instruction in dimensioning, airframe, mechanical control, hydraulic systems and electronic systems.

Indicators of Success: Prior to entry into this course, the vocational student will display mastery of the skills indicated in Electrical and Electronic Drafting - 9257.01.

Clock Hours: 135

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PREFACE

This quinmester course outline is designed for cooperative students who have expressed an interest in the aircraft and missile field of engineering and drafting. It is intended to cover more advanced subject material than was described in quinmester course outlines 9255.01-9255.05. This course covers fundamentals, working drawings, auxiliary views and sections that are related to the aircraft and missile field of drafting. This course is considered advanced training as the student is introduced to various types of tools and equipment and is provided with an opportunity for instruction and laboratory experiences.

The course is taught in a two-hour block for 90 hours or a three-hour block for 135 hours. In each instance, the course consists of five instructional blocks; however, the three-hour session permits the student to cover each block in more detail and also provides additional opportunity to practice and increase his or her skills. The course is concluded by a post-test.

An adjunct to the listed instructional methods is provided through the instructor's utilization of audiovisual equipment and materials.

The bibliography lists the basic references, workbooks and supplementary references used by the teacher in presenting the material. These books are available to the student through the instructor.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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with Suggested Hourly Breakdown

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Airframe	1
Mechanical Control System	2
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Orientation to Aeronautical Drafting	3
Mathematics	4
Orthographic Projection	4
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III. WORKING DRAWINGS (30 Hours)	
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GOALS

The student must be able to demonstrate:

1. The ability to develop and direct his or her activities along lines parallel to present day drafting practice.

2. Skills in the selection and handling of tools and equipment through organized practice sessions in the related field of fasteners of all types.

3. The skills needed to perform as a draftsman with assigned tasks that may require pictorial drafting. The student will become knowledgeable with drawings that require illustration in the industry.

4. The ability to advance his knowledge and skills in drafting to meet the requirements of the electrical and electronic industry.

5. The desire for advancemenet in his chosen vocation by introducing and keeping before him achievements of leading machine designers, engineers and draftsmen, especially in the piping field.

6. The use of tools and equipment to perform a task in a predetermined length of time and to the satisfaction of a drawing checker.

SPECIFIC BLOCK OBJECTIVES

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BLOCK I - INTRODUCTION TO AERONAUTICAL DRAFTING

The student must be able to:

1. Define the study of the aircraft and missile development.
2. Prepare drawings used in the aeronautical industry and be able to explain why he is drawing these drawings.
3. Exhibit the ability to define the purpose of the structural breakdown in this field of drafting.
4. Draw and sketch preliminary drawings both freehand and to scale.
5. Prepare proposals, model and mock-up drawings using functional drafting as a guide in the preparation.
6. Construct working drawings and design layouts used in the aeronautical field of drafting.
7. Demonstrate an understanding of the type of dimensioning that is used in this field.
8. Prepare drawings that use structural members with castings and forging parts.
9. Exhibit the ability to understand metals and shapes used in this field as well as the machining operations that are common to aeronautical drafting and production.
10. Draw drawings that use the various types of joining in this field, such as welding, brazing and soldering.
11. Demonstrate an understanding of the various types of systems such as hydraulic and mechanical and the various types of electronic systems used in aircraft and missile work.

BLOCK II - FUNDAMENTALS

The student must be able to:

1. Explain the history of ship and marine design that is the background for aircraft standards.
2. Determine how important the draftsman is to this field and how, in many ways, he performs the duties of the engineer.
3. Draw projections that call for the use of mathematics using trigonometry and descriptive geometry.
4. Prepare drawings that call for the use of orthographic projection.
5. Draw this type of drawings using the tools and equipment that will be introduced at this time.

BLOCK III - WORKING DRAWINGS

The student must be able to:

1. Construct aeronautical drawings as a detail while using the corresponding industrial standard in this field.
2. Prepare assembly drawings with the proper features necessary to produce and assemble parts used in the industry.
3. Demonstrate an understanding of functional drafting which is of primary importance in this field of engineering and design.
4. Draw subassemblies with particular attention to saleable or nonsaleable features.

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BLOCK IV - AUXILIARY VIEWS AND SECTIONS

The student must be able to:

1. Prepare drawings that call for auxiliary views necessary for production of the part.
2. Draw parts that require revolving views to properly depict the design thought.
3. Demonstrate an understanding of the various shapes and projections necessary to draw auxiliary views.
4. Exhibit the ability to draw sectional views and know why he or she is doing the task assigned.
5. Use all the various types of sectional views that are standard in the industry.

BLOCK V - QUINMESTER POST-TEST

The student must be able to:

1. Satisfactorily complete the quinmester post-test.

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Course Outline

DRAFTING 3 - 9257
(Aeronautical Drafting)

Department 45 & 48 - Ouin 9257.02

I. INTRODUCTION TO AERONAUTICAL DRAFTING

A. Introduction
   1. Studying airplane development
      a. Airframe
      b. Missile
   2. Drafting practice

B. Purpose of Structural Breakdown in Aeronautical Drafting

C. Types and Purpose of Aeronautical Drawings
   1. Preliminary drawings
      a. Sketches
         (1) Freehand
         (2) To scale
      b. Proposals
   2. Functional drafting
      a. Use of
      b. All types
   3. Proposal drawings
   4. Model drawings
   5. Mock-up drawings
      a. Sketches
         (1) Freehand
         (2) To scale
      b. Working
         (1) Detail
         (2) Assembly
         (3) Installation
   6. Design layouts
      a. Working drawings
      b. Preliminary layouts
   7. Working drawings
   8. Detail drawings
   9. Assembly and installation drawings

D. Dimensioning Aeronautical Drawings
   1. Functional
      a. Decimal
      b. Metric
   2. Purpose

E. Airframe
   1. Structural members
      a. Casting
         (1) Temporary
         (2) Permanent
         (3) Precision

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b. Forging
c. Extrusions
d. Stock shapes - all forms
e. Sheet metal
f. All metals - all alloys

2. Types and ways of covering structure
   a. Sheet metal
   b. Fabric
   c. Wood
3. Major assembly and subassemblies
4. Specifications for aluminum and its alloy
5. Fabric and rubber products
6. Machine operations - sheet metal
   a. Cutting and blanking
   b. Bending and forming
   c. Drawing and spinning
   d. Stretching
7. Machine operations - shapes and plates
   a. Drilling
   b. Reaming
   c. Spot facing
   d. Counterboring
   e. Threading
      (1) Roll
      (2) Cut
   f. Turning and boring
   g. Grinding
   h. Milling and broaching
   i. Castings
      (1) Sand
      (2) Permanent
      (3) Die
   j. Forging
   k. Welding
      (1) Definitions
         (a) Fusion
         (b) Resistance
      (2) Use of
   l. Brazing and soldering
   m. Methods of joining

F. Mechanical Control System
   1. Levers
   2. Cables
   3. Turn buckles
   4. Pulleys
   5. Safety ties

G. Hydraulic System
   1. Tubing
      a. Size
      b. Location
      c. Use of
      d. Pressure

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I. INTRODUCTION TO AERONAUTICAL DRAFTING (Contd.)

2. Valves
   a. Symbol
   b. Definition
   c. Use of
3. Pumps
   a. Types
   b. Function
4. Liquids
   a. Types
   b. Definition
   c. Use of
5. Operating units
6. Manual and automatic controls
   a. Military use
      (1) Both systems
      (2) Safety
   b. Commercial use

H. Electronic System
1. Power plants
   a. Types
      (1) AC
      (2) DC
   b. Communication
   c. Function of aircraft or missile
2. Firing system of engine
3. Controls on equipment
   a. Safety
   b. Function
   c. Warning
4. Dials
   a. Function
   b. Warning
   c. Safety
5. Wiring diagrams
   a. Harness
      (1) Mock-up
      (2) Nail board
   b. Illustration
      (1) Service manual
      (2) Shop use
6. Communications
   a. On board
   b. Tower
   c. Navigation
   d. Weather

II. FUNDAMENTALS

A. Orientation to Aeronautical Drafting
1. History

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a. Ship building
b. Marine design
2. Importance to industry
3. Occupation of drafting

B. Mathematics
1. Trigonometry
a. Functions
b. Right triangles
2. Geometry
a. Descriptive
b. Construction
c. Circles, angles and arcs

C. Orthographic Projection
1. Lines
2. Figures
3. Theory of projection
a. Projection planes
b. Projection lines
c. Projection views
4. Visualization of views
5. Selection of views
a. Functional drafting
b. Definition
6. Hidden features
7. Laying out, positioning and spacing of views

D. Use of Instruments
1. Drafting tools
a. Pencil - all types and points
b. Straightedge, drafting machine, etc.
c. Triangles
d. Templates
e. Scales
2. Material
a. Paper
b. Cloth
c. Mylar

E. Sketching
1. Use of
2. Practice

III. WORKING DRAWINGS

A. Constructing Aeronautical Drawings
1. Detail drawings
a. Types
b. Material list
c. Dimensioning
(1) Machine
(2) Use of
(3) For who

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III. WORKING DRAWINGS (Contd.)

(4) For what
(5) Principles
(6) Lines, symbols and finish marks
(7) Rules
(a) Placement
(b) Size
(8) Allowances and tolerances
(9) Classification of fits
d. Surface finishes
e. Surface quality
f. Selection of materials
g. Checking
h. Heat treating
i. Drawing changes
2. Assembly drawings
a. Types
b. Techniques of representing parts
c. Identification of parts
d. Notes and specifications
e. Drawing changes

B. Functional Drafting
1. Dimensioning for assembly
a. Use of
b. For who
c. For what
d. Principles
e. Rules
(1) Locating
(2) Functional
2. Subassemblies
a. Partial assembly
b. Saleable item

IV. AUXILIARY VIEWS AND SECTIONS

A. Auxiliary Views
1. Purpose
2. Plane relationships
a. Location with respect to principal planes
b. Notation of auxiliary planes and projections
c. Location with respect to object
3. Primary auxiliary view
a. Planning folding lines
b. Locating reference plane
c. Drawing views using reference plane
(1) Development
(2) Folding lines
(3) Reference planes
d. Classification of views
(1) Depth

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(2) Height
(3) Width

4. Revolving views
   a. Reasons
      (1) Functional
      (2) Simplification
   b. Location
5. Partial views
6. Steps in drawing auxiliary views
7. Shapes in auxiliary views
   a. Symmetrical
   b. Asymmetrical
   c. Curved surfaces
   d. Elimination of principal views
8. Double-auxiliary view
   a. Projected from a front auxiliary view
   b. Projected from a top auxiliary view
   c. Projected from a side auxiliary view

B. Sectional Views
1. Purpose
2. Types of sections
   a. Full
   b. Half
   c. Offset
   d. Broken-out
   e. Revolved
   f. Removed or rotated
   g. Auxiliary
   h. Assembly
3. Drawing practice for sectional views
   a. Cutting plane
   b. Hidden detail
   c. Visible detail
   d. Section lining
      (1) Thin section
      (2) Large section
      (3) Adjacent parts
      (4) Unusual shapes
      (5) Section lining symbols
4. Conventional practices
   a. Parts not sectioned
   b. Spokes and arms in section
   c. Ribs in section
   d. Lugs in section
   e. Alternate cross-hatching
   f. Aligned parts
   g. Fillets and rounds
   h. Violating a principle
   i. Conventional breaks
   j. Conventional symbols

V. QUINMESTER POST-TEST

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QUINMESTER POST-TEST SAMPLE

Quinmester Post-Test

Name _____ Date _____ Score _____

Multiple Choice Test Items

Each statement needs a word, figure or phrase to make it correct. Only one of the choices listed is correct. Place the letter of the choice you make in the space provided at the left.

___ 1. Aeronautical drafting received most ot its standards from:

a. The electronic industry
b. The ship building industry
c. The machine design industry

___ 2. Preliminary drawings are usually used by the firm for:

a. Design imputs
b. Production imputs
c. Illustration

___ 3. Mock-up drawings are used to build the:

a. First airplane
b. Full-scale model
c. Production airplane

___ 4. Aeronautical dimensioning is almost always:

a. Fractional
b. Metric
c. Decimal

___ 5. Airframe or missile structure is made from:

a. Castings
b. Sheet metal
c. Fabric

___ 6. Blanking, forming and bending machine operations are related to:

a. Castings
b. Sheet metal
c. Forging

___ 7. Spotfacing, counterboring and reaming operations are related to:

a. Diameters
b. Finish treatments
c. Sheet metal operations

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___ 8. Sand, permanent and die are words that are related to:

a. Forgings
b. Extrusions
c. Castings

___ 9. A lever is an item that is used in one of the following aeronautical drafting systems:

a. Electronic
b. Hydraulic
c. Mechanical

___10. The firing system of the engines is controlled by which of the following systems:

a. Hydraulic
b. Mechanical
c. Electronic

True-False Test Items

Each of the following statements is either true or false. If the statement is true, draw a circle around the letter T following it; if the statement is false, draw a circle around the F. If a statement is false in part it is entirely false.

1. Ship building and marine design have played a large part in settting the standards for aeronautical drafting. T F

2. Advanced mathematics is not that important in preparing drawings for aeronautical drafting. T F

3. Descriptive geometry will help in the projection of views. T F

4. Orthographic projection with functional drafting as a guide, plays a major part in aeronautical drafting. T F

5. Selection of views is not necessary in this field of drafting. T F

6. Basic drafting tools and equipment are required but some special material will be used. T F

7. Loftsmen draw on glass cloth to accomplish a higher degree of accuracy. T F

8. Sketching is very important in this field of engineering but a sketch is never used in the production of aircraft or missile parts. T F

9. Visualization of views is not necessary because when the draftsman draws the view it develops as he or she does the work. T F

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10. Layout functions are done by the draftsman because most of the preliminary work is done by the engineer. T F

Completion Test Items

Fill in the blank or blanks with the words or word that makes the statement correct.

1. The two major types of drawings used in this field of engineering are detail and _____ drawings.
2. Detail drawings show _____ features that are necessary to produce the part.
3. Simple parts are placed in the _____.
4. For who is one part of the "vital point" and the other part is _____.
5. Assembly drawings show only details necessary to assemble or _____ the parts.
6. Drawing changes are recorded when a drawing is changed in the _____.
7. Another word for simplified drafting is _____ drafting.
8. The knowledge of what the shop can do is important but the fact of _____ they do it is not the concern of the draftsman.
9. Surface finish, tolerances and allowances are features that are found on a _____ drawing.
10. Finish drawings are used for the production aircraft but many _____ are used for the mock-up.

Short Answer Questions

Answer the following questions by a single word, phrase or short sentence.

1. What is the purpose of auxiliary views?
2. Why would you show a revolved section?
3. What does the word "fillet" mean to you?
4. What does the word "round" mean to you?
5. What would you call a view that is shown cut in half?

6. What would you call the line that is used to show where the cut is taking place to show a half-section?

7. What are the lines called that show the symbols in a sectional view?

8. Where should the view be placed when a section is taken on a crowded drawing?

9. Why is alternate cross-hatching used on views that are in section?

10. What is the reason for zoning the sections or cutting planes?

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ANSWER KEY TO QUINMESTER POST-TEST

Multiple Choice Test Items

1. b
2. a
3. b
4. c
5. a
6. b
7. a
8. c
9. c
10. c

True-False Test Items

1. T
2. F
3. T
4. T
5. F
6. T
7. T
8. F
9. F
10. F

Completion Test Items

1. Assembly
2. Machine
3. Bill-of-material
4. For what
5. Install
6. Revision block
7. Functional
8. How
9. Detail
10. Sketches

Short Answer Questions

1. True view
2. Expedience
3. Inside radius
4. Outside radius
5. Full section
6. Cutting
7. Section
8. Behind cutting lines
9. Clarity
10. Find view